

Abstract

Geoff has been used to deploy **novel optimization algorithms** at GSI and CERN. The **GUI app** is now decoupled from CERN infrastructure. The PUMA experiment provides the first instance of Geoff being used with the **EPICS** control system. The **Remote Geoff** prototype showcases the project's flexibility.

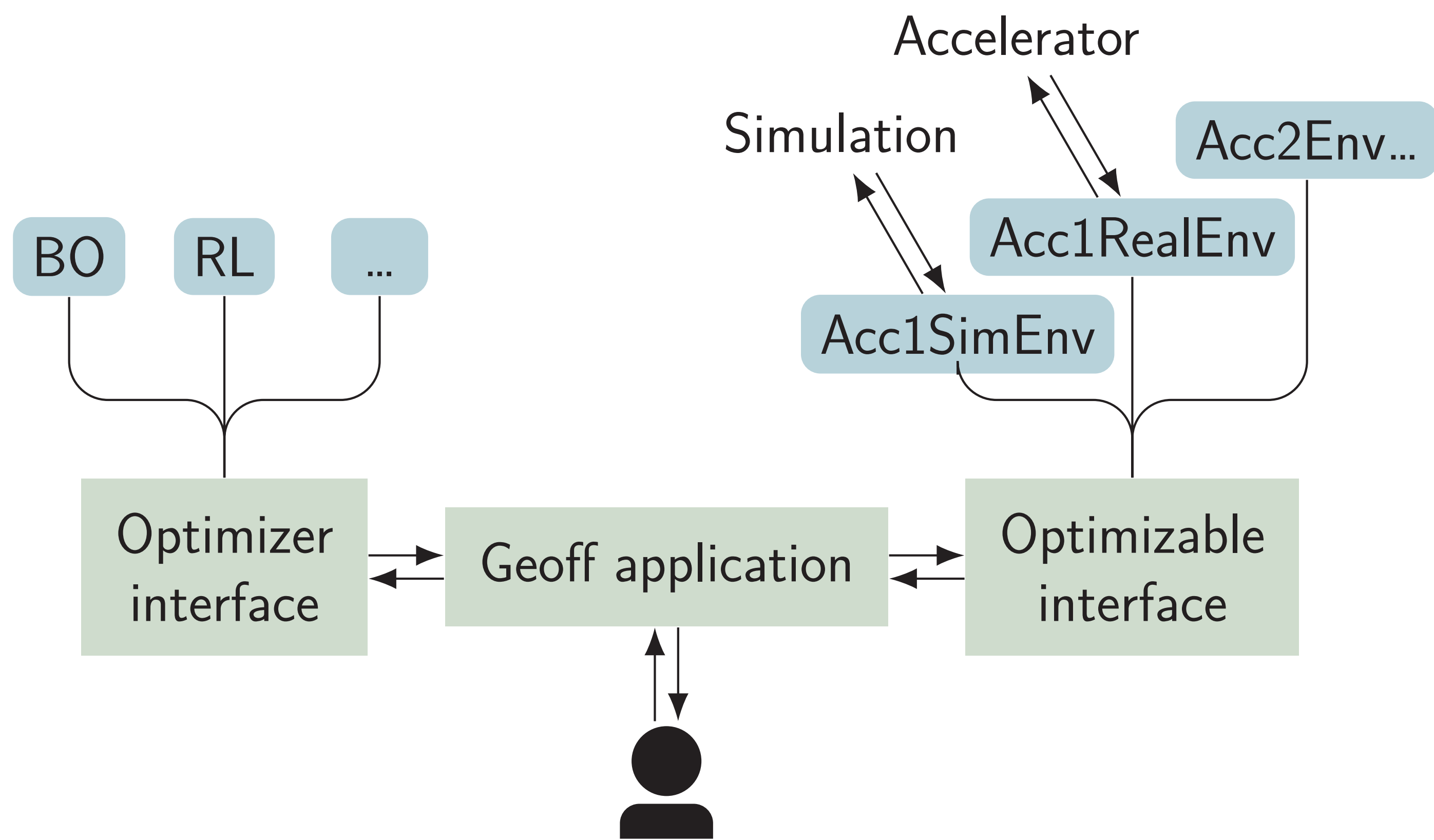
Weblinks

- https://gitlab.cern.ch/geoff/
- https://github.com/geoff-project/
- https://cernml-coi.docs.cern.ch/

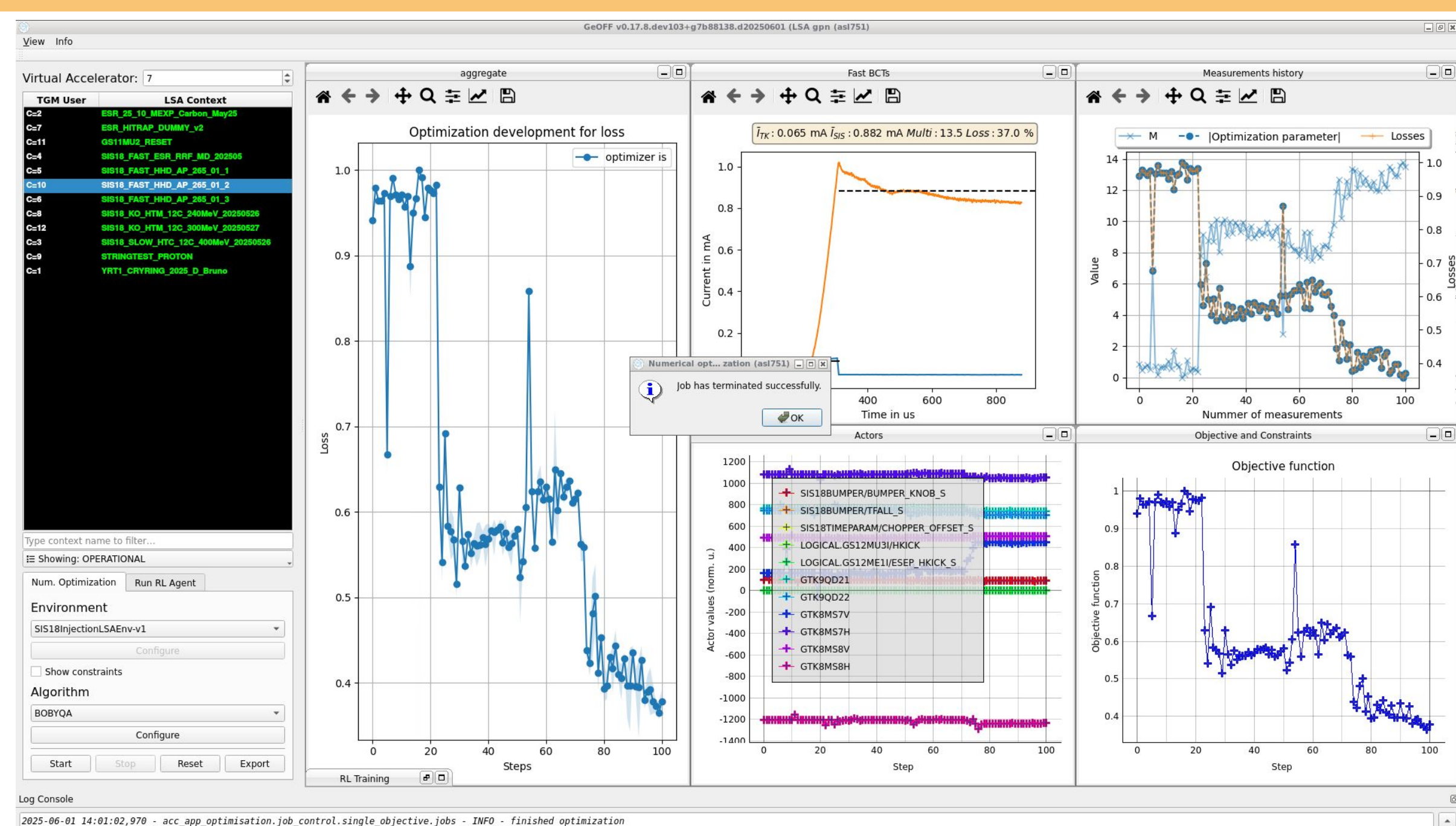
Geoff Primer

Generic Optimization Framework and Frontend

- developed by CERN and GSI[1]
- easily integrates RL, BO, and optimization
- can handle arbitrarily complex problems
- easy to adapt code on-the-fly
- runs in terminal and GUI[2]

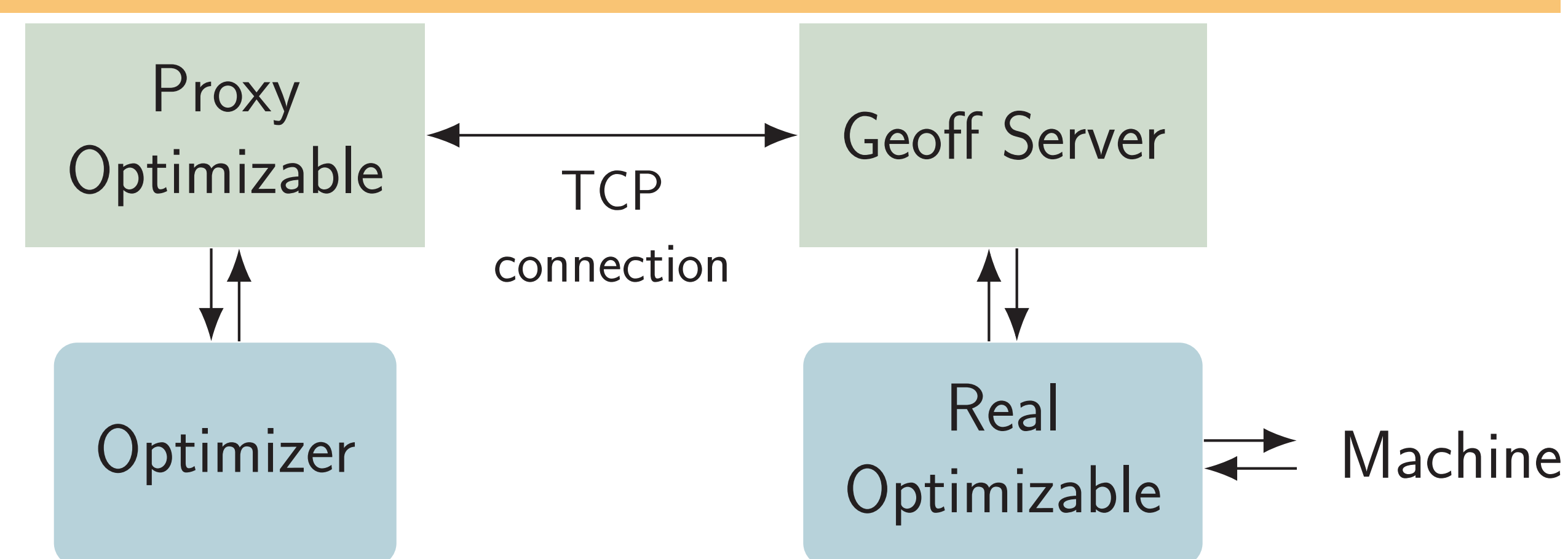


GUI Development



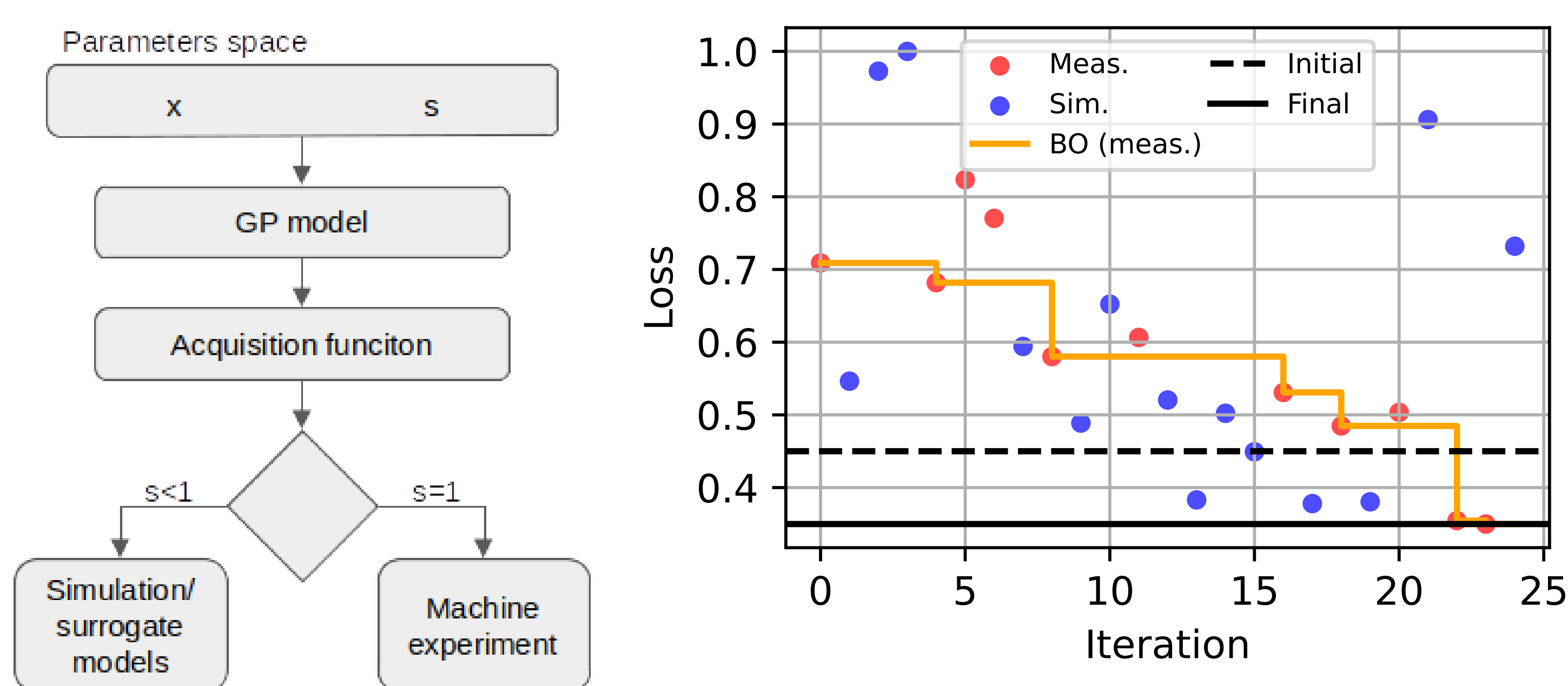
- working prototype on non-CERN GUI application
- reset to arbitrary setting of previous optimization
- still work in progress:
 - split into easy-to-assemble modules
 - constraints 2.0 and multi-objective optimization

Remote Geoff



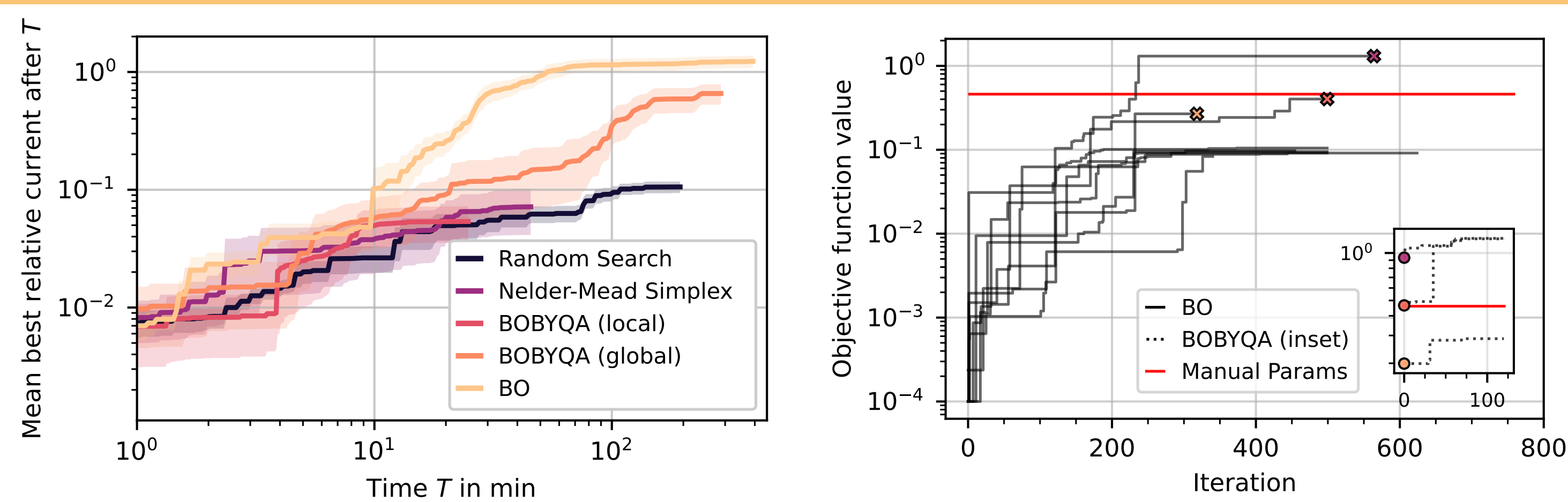
- runs optimizer and optimizable on different computers, e.g.:
 - problem on slow machine in protected network,
 - algorithm on fast machine in general network
- authorization via SSH and shared secret

Multi-Fidelity Bayesian Optimization



- MFBO used to optimize SIS18 multi-turn injection
- combines **high-fidelity** measurements with **low-cost** simulations
- beam loss reduced from 45% to 35%
- 25 iterations total, 11 machine evaluations

PUMA Collaboration[3]



- left:** electron beam steering (9 parameters)
- right:** multi-reflection time-of-flight mass spectrometer potential-profile optimization (7 parameters)
- Bayesian optimization refined with BOBYQA
- First use of Geoff with EPICS**

References / Acknowledgments

- P. Madysa et al., doi:10.1016/j.softx.2025.102335
 - S. Appel et al., doi:10.18429/JACoW-IPAC2024-MOPS68
 - M. Kraeft, "Automated online optimization of the PUMA Offline Ion Source", B.Sc. thesis (submitted Feb 23, 2026)
- EURO-LABS project (EU Grant Agreement no. 101057511)